MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

HCB1011 – CELL BIOLOGY

(All sections / Groups)

25 OCTOBER 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

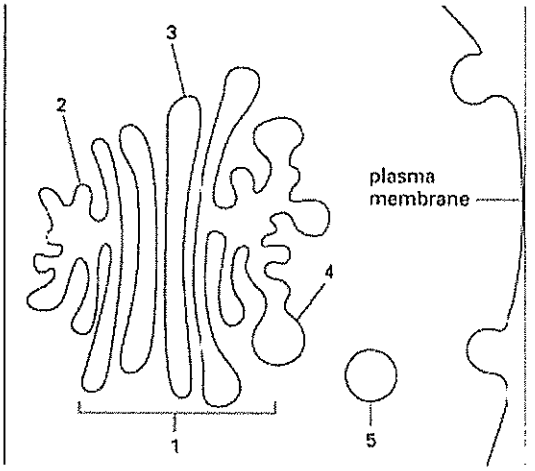
INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **6** pages with **5** Questions only.
2. Answer **ALL THE QUESTIONS**. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please print all your answers **clearly** and **neatly** in the Answer Booklet provided.

QUESTION 1

(a) Give at least 3 evidences supporting the endosymbiotic theory. [1.5 marks]

(b) Match the following: [2.5 marks]



i. Cisterna _____

ii. Golgi stack _____

iii. Secretory vesicle _____

iv. *trans* Golgi network _____

v. *cis* Golgi network _____

(c) A disease is characterized by the lack of a particular glycosylated protein on the cell membrane. Which organelle is most likely to be defective? Why? [2 marks]

(d) Where in the cell can ribosomes be found? What is the main biological function of ribosomes? [2 marks]

(e) What is meant by the description "antiparallel complementary" regarding the strands that make up DNA? Use a simple drawing to illustrate your answer. [2 marks]

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QUESTION 2

(a) At a specific area of a chromosome, the sequence of nucleotides below is present where the chain opens to form a replication fork:

3' C C T A G G C T G C A A T C C 5'

An RNA primer is formed starting at the underlined T (T) of the template. State the RNA primer sequence (please indicate the 5' end and 3' end of the RNA primer). [1 mark]

(b) Name the enzyme/protein that does the following job in DNA replication: [2 marks]

i. To relieve tension in the DNA ahead of the replication fork

ii. To add nucleotides to the 3' end of a growing DNA strand

iii. To join Okazaki fragments together

iv. To hold the DNA strands apart while they are being replicated

(c) Unlike bacterial chromosomes, the chromosomes of eukaryotes are linear, meaning that they have ends. These ends pose a problem for DNA replication, the "end-replication problem". The DNA at the very end of the chromosome cannot be fully copied in each round of replication, resulting in a slow, gradual shortening of the chromosome.

Briefly explain how eukaryotic cells prevent the loss of genes as chromosome ends wear down. [3 marks]

(d) What are the purposes of the 5' and 3' modification of eukaryotic mRNA? [1 mark]

(e) State if the followings are TRUE or FALSE. [3 marks]

i. Messenger RNA is usually polycistronic in eukaryotes

ii. Transcription factors function to help move ribosomes along the mRNA.

iii. RNA processing occurs when amino acids are removed from nascent proteins.

iv. A 3' poly-A tail and a 5'-cap are common components of prokaryotic RNAs.

v. When one speaks of a 5'-cap, one is describing the addition of a base, usually thymine, to the 5' end of a completed peptide.

vi. The triplet AUG is commonly used as a start codon during translation.

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QUESTION 3

(a) What does it mean when we say that the genetic code is degenerate? [1 mark]

(b) Refer to the codon chart provide on Page 6 to respond to the following:

i. Shown here is a theoretical viral mRNA sequence:

5'-AUGCAUACCUAUGAGACCCUUGGA-3'

Assuming that it could arise from overlapping genes, how many different polypeptide sequences can be produced? What are the sequences? [3 marks]

ii. A base substitution mutation that altered the sequence in (i) eliminated the synthesis of all but one polypeptide. The altered sequence is shown here:

5'-AUGCAUACCUAUGUGACCCUUGGA-3'

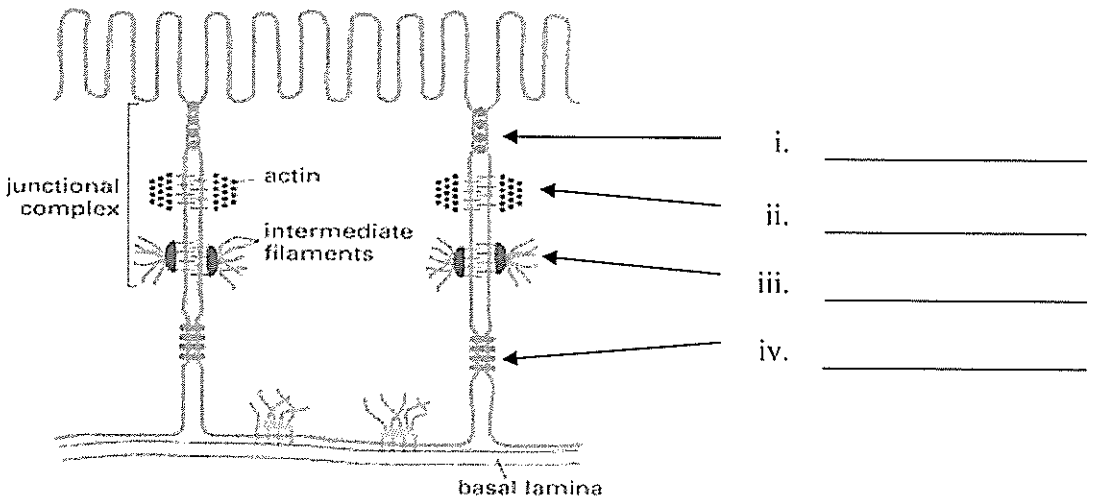
Determine why. [2marks]

(c) For eukaryotic proteins, what is the function of a sorting signal? Describe with an example. [2 marks]

(d) List the major steps in the protein secretory pathway. [2 marks]

QUESTION 4

(a) Name the cell junctions in the figure below. [2 marks]



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(b) The extracellular matrix (ECM) is the non-cellular component present within all tissues and play important roles in regulating a cell's dynamic behavior. Name at least SIX functions of the ECM. [3 marks]

(c) Cells communicate through different mechanisms, depending primarily on the distance between the signaling and the responding cells. Name and describe THREE basic mechanisms of cell signaling. [3 marks]

(d) What is a second messenger? Why do you suppose it is called this? [2 marks]

QUESTION 5

(a) Draw a diagram to illustrate the phases and checkpoints in a cell cycle. Describe what happens in each of the checkpoints. [4 marks]

(b) Fill the blanks in the following statements. [2 marks]

i. _____: A protein that functions as a cell cycle regulator and causes cell death (apoptosis) under high sunlight exposure.

ii. _____: A protein that combines with cyclins to exert local control of the cell cycle.

iii. Mutant versions of genes that are normally involved in promoting the cell cycle are known as _____.

iv. Rb is a tumor suppressor gene whose normal function is to _____ cell division.

(c) Differentiate among the following types of genes: tumor suppressor gene and protooncogene. [2 marks]

(d) When a cell becomes cancerous, it develops traits that normal cells do not have. Name at least FOUR differences between cancer cells and normal cells. [2 marks]

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Second Letter

1st letter	U	C	A	G	3rd letter
U	UUU Phe UUC UUA Leu UUG	UCU UCC UCA Ser UCG	UAU Tyr UAC UAA Stop UAG Stop	UGU Cys UGC UGA Stop UGG Trp	U C A G
C	CUU CUC Leu CUA CUG	CCU CCC CCA Pro CCG	CAU His CAC CAA Gln CAG	CGU CGC CGA Arg CGG	U C A G
A	AUU AUC Ile AUA AUG Met	ACU ACC ACA Thr ACG	AAU Asn AAC AAA Lys AAG	AGU Ser AGC AGA Arg AGG	U C A G
G	GUU GUC Val GUA GUG	GCU GCC GCA Ala GCG	GAU Asp GAC GAA Glu GAG	GGU GGC Gly GGA GGG	U C A G

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